# National Ignition Facility

Lawrence Livermore National Laboratory
Livermore, CA

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# Introductory Information

- Location: National Ignition Facility (NIF) at LLNL
- Visit: Oct. 27, 2005 (8:30 am – 5:30 pm)
- Visitor(s): Erik Gottschalk
- Hosts: Paul Van Arsdall, Robert Bryant, Bob Cauble, Ed Hartouni, Glenn Hermes, Larry Lagin, George Pavel, Robert Reed, Bruno Van Wonterghem

- Overview:
  The primary research goal for NIF is to use a a system of 192 lasers to study inertial confinement fusion. NIF is expected to be fully operational by 2009.

- Purpose of control room:
  Control and monitoring of the NIF facility.
- List of activities during visit:
  - Tour of NIF
  - Meeting in the control room
  - Discussion with Phil Adams about Shareplex
- When was the control room built: Winter, 2001
- How long did it take to complete: 6 months


NIF-0605-10997-L28
27EIM/cld

P9292

# National Ignition Facility Project Status

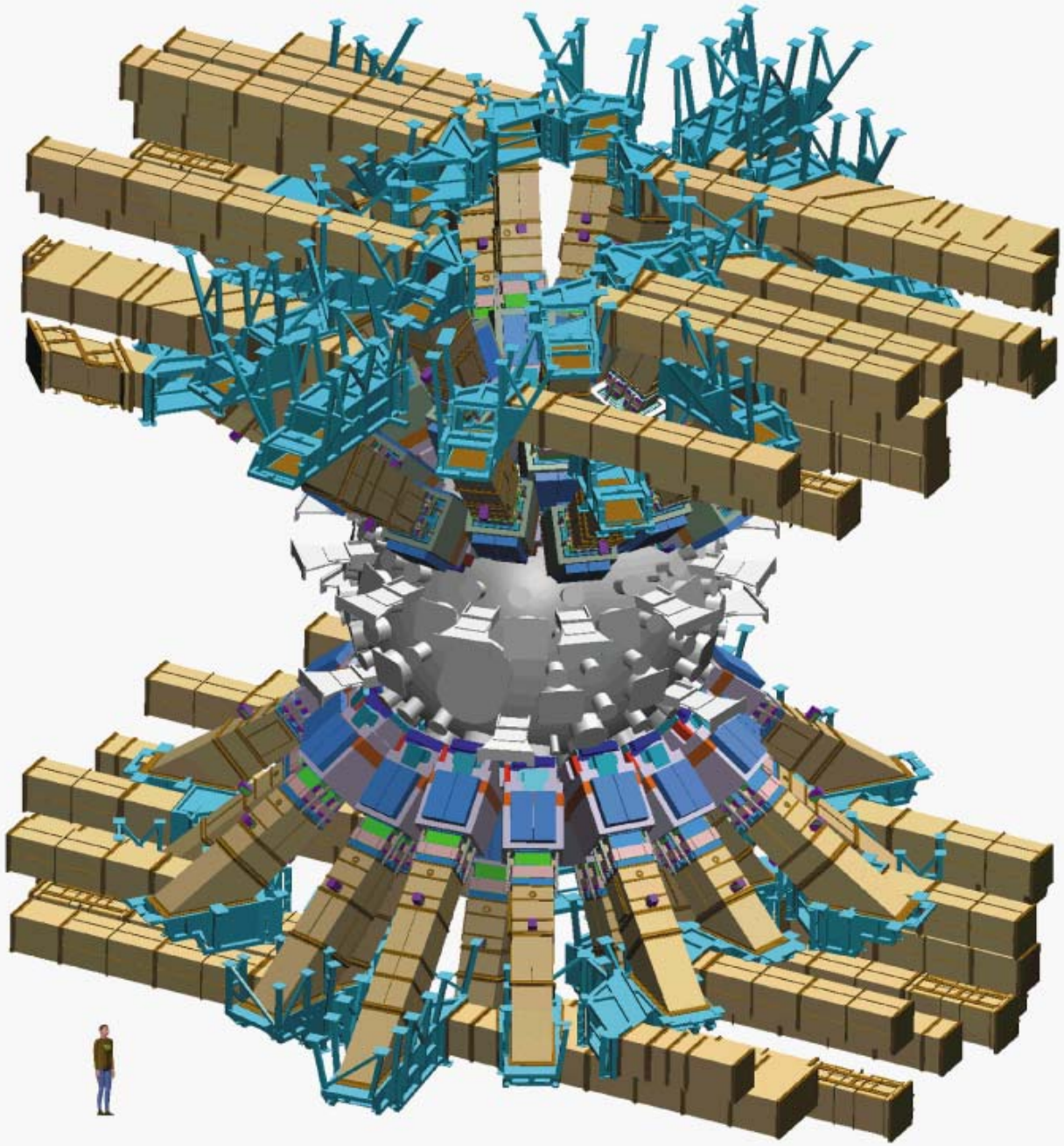
The National Ignition Facility

- $3.5 billion ICF laser project started in 1996
- NIF is 80% complete
  - Completed facility and beam path
  - Conducted 400 shots with 1st quad, including user campaigns
  - Applied lessons learned to optimize designs
  - Transitioned to bundle-based control architecture
  - Solved software distribution and scaling challenges
  - Delivered 1.1 MSLOC including automated shots
  - Assembly, installation, and commissioning is underway

**NIF is on track for Project completion in 2009**


Laser Specifications
192 Laser Beams
Energy ⇒ 1.8 MJ
Power ⇒ 750 TW
NIF-0205-10333r2
15EIMdj


4 Clusters
Beampath
Complete
NIF-0805-11265
31EIM/ld
P9615



NIF-0502-04871
09GD/tr

F0014
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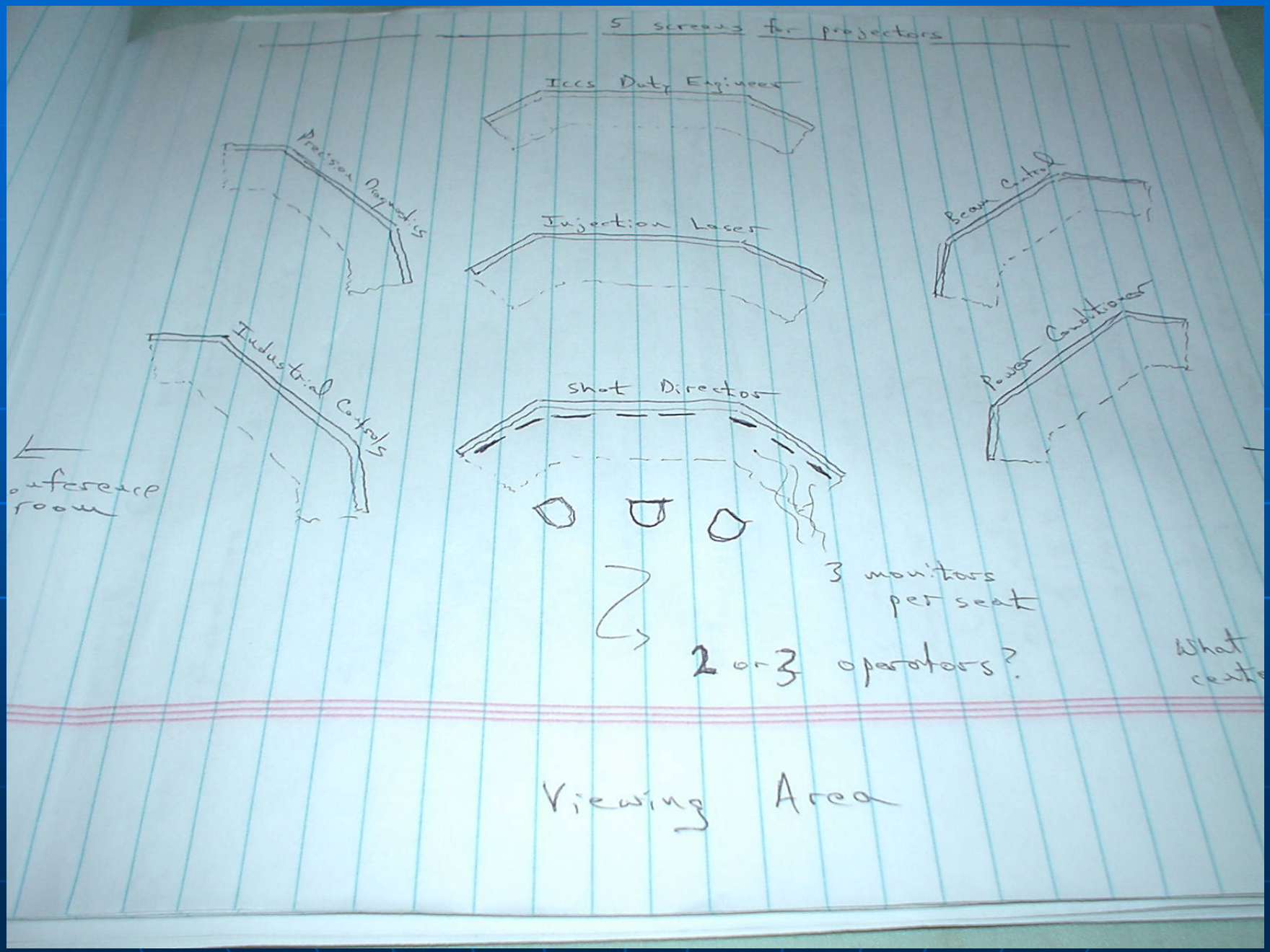
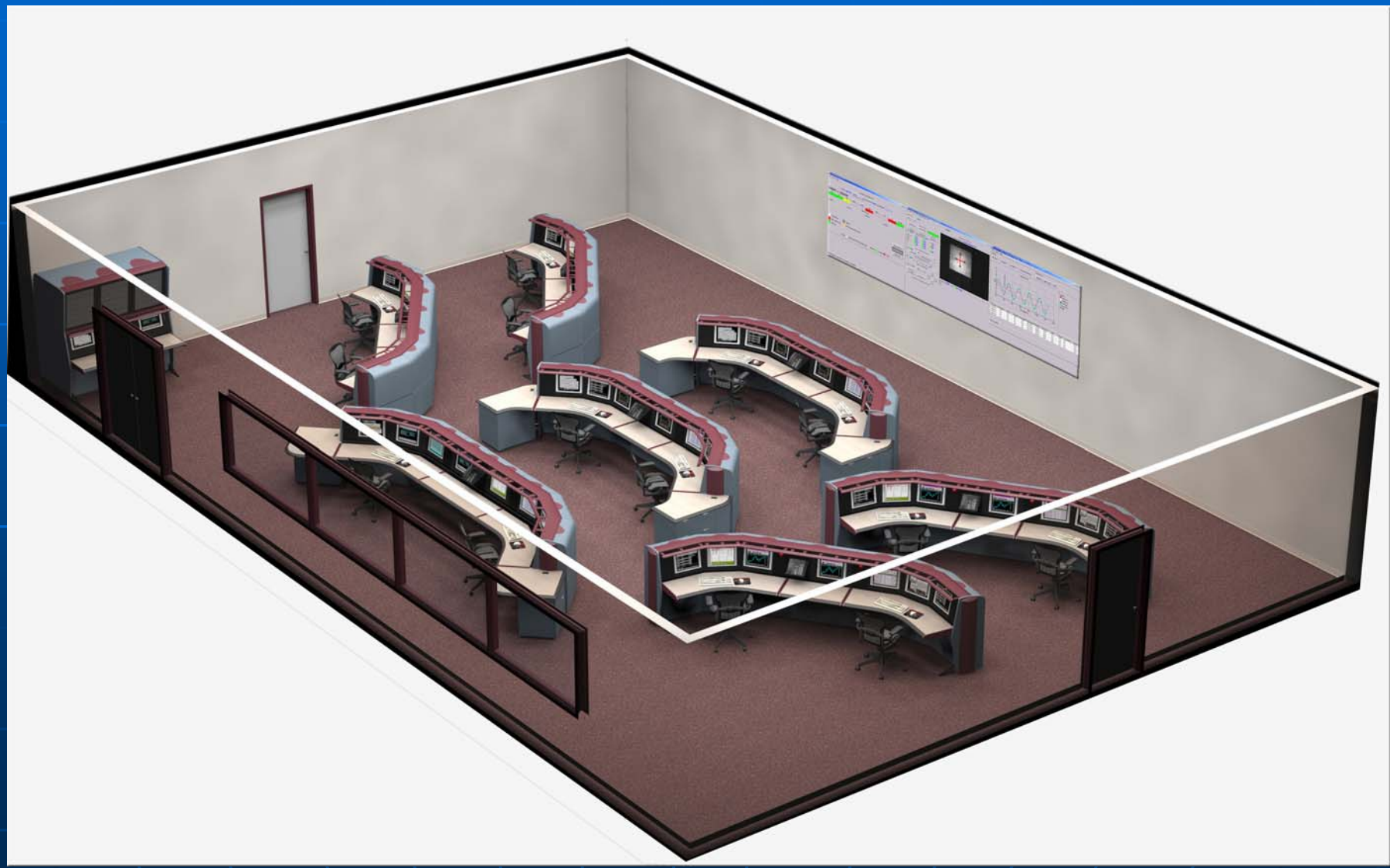
# Physical Layout

- Sketch of the Control Room: (see following slides)
- Describe the lighting: fluorescent overhead lighting, which is dimmed (turned off?) during shot setup and operations. Task lighting above each monitor.
- Describe the flooring: raised floor, carpet
- Describe the noise control: carpet was installed to reduce noise levels
- Describe the console: Modeled after the NASA Johnson Space Center. Each console has two console stations, 3 LCD monitors per station, between each station is a monitor attached to a PC on the “external” network for personal use, for example email. Fan mounted on top for cooling PCs.
- Take photos of the control room: (not permitted)
- Describe the screens: console stations have three LCD screens that act as a single display with Triplus Winspace “virtual” desktops, five 1280 x 1024 projectors ($15K from Proxima) produce a large “single” display area at the front of the control room, which is controlled by the Shot Director
- How many consoles/people working: (see following slides)


5 screens for projectors
Iccs Duty Engineer
Precision Operations
Injection Laser
Beam Control
Industrial Controls
Power Conditioner
Shot Director
conference room
3 monitors per seat
2 or 3 operators?
What
Viewing Area

# NIF control room




ACS UNITY ENGINEER
POWER CONDITIONING

# Hardware and Software

- Describe the PCs:
  - DELL PCs for console stations, with Triplus Winspace for virtual desktops. Other virtual desktop products were prototyped.
  - Kontron (or ICS Advent) rack-mounted “inducstrial” PCs with Datapath video cards to drive the 5 projectors (Triplus Winspace)
- Describe the monitors:
  - 1280 x 1024 LCDs
- Describe the communication equipment
  - Video feed from video cameras in the building
  - Single-earpiece headset radios for communication in the building
  - Dual channel ClearCOM headsets with boom microphone are used in the testbed facilities (used for software development & testing)
  - No video conferencing equipment
- Describe the application software
  - NIF control system software
  - Web-based access to archived data, even though closed network
  - Desktop sharing is used within the closed network
  - Shareplex software (from Quest) is used to synchronize “internal” and “external” ORACLE databases (more on this later)

# Networking and Security

- What is the speed on the transfer link?
  - Fully redundant gigabit ethernet
- How far is the data sent?
  - Data remains onsite
- Is there a dedicated link?
  - Yes, internal network
- How many users are connected?
  - A few hundred
- What security is being used?
  - Internal network for NIF control
  - Firewall
  - External network for monitoring. This network is accessible using VPN from offsite
  - External network is allowed into the control room for email access
  - Shareplex used to “push” results out of internal network

# Cost to Build and Administer

- What is the cost breakdown?
  - $250K for consoles (not including PCs and monitors)
  - $15K for each of the 5 Proxima projectors
  - $100K for several Shareplex licenses (~$10K per license)
- What is the administration cost (people)?
  - ???
- Have there been many upgrades?
  - Facility is still under construction
  - Carpeting was installed for noise abatement
- How long did it take to build?
  - ???

# Operations Model

- Are there shifts?
  - Yes
- How many people on shift?
  - Up to 14 people on shift
- Who makes the decisions?
  - Shot director
- Who has control to change things?
  - Only one operator per console station is allowed to make changes
- Operations model:
  - NIF uses a “countdown model” for each shot. Two astronauts were involved in developing the model.

# Shareplex (from Quest)

Shareplex solves NIF's problem of being able to provide complete access to the data for monitoring purposes, without giving "outside" users access to the control network.